

REMARKS

Reconsideration of the subject application in view of the preceding amendments and the following remarks is respectfully requested. Claims 1-3, and 7-9 are pending in this application. Claim 4 has been cancelled without prejudice and Claims 5-6 were previously cancelled. Claims 1 and 8 have been amended herein to further define and more particularly point out the subject matter regarded as inventive. Support for the amendments can be found throughout the application as filed and it is respectfully submitted that no new matter has been introduced by this amendment. Moreover, as these amendments are being made in response to a Final Office Action, it is respectfully requested that the amendments be entered, as they place the application in better form for appeal.

References from International Search Report

Enclosed herewith is a PTO Form 1449 listing U.S. Patents No. 5,725,220 to Clark et al., and 6,076,832 to Pow. These references were listed in the International Search Report submitted with the original filing of this application under 35 U.S.C. § 371(c). As such, these references have been considered, however they have not been listed as cited by the Examiner. It is respectfully requested that the references be initialed as considered by the Examiner to ensure they appear on the face of any patent issuing in this application.

Finality of Rejections

It is respectfully submitted that the finality of the rejections set forth in the Final Office Action mailed July 17, 2007 is premature. As stated in MPEP § 706.07(a), second paragraph, “Under present practice, second or any subsequent actions on the merits shall be final, *except where the examiner introduced a new ground of rejection that is neither necessitated by applicant’s amendment of the claims nor based on information submitted in an information disclosure statement filed during the period set forth in 37 C.F.R. 1.97(c) with the fee set forth in 37 C.F.R. 1.17(p)*” (emphasis added).

All of the rejections are based on Japanese Patent Application No. 08054067A to Kinoshita, which was not cited in any IDS or Office Action prior to the Final Office Action. Moreover, the previous amendments were essentially for incorporation of basic elements from dependent claims into independent claims as well as for matters of form. This made the previous amendments reasonably foreseeable before the first Office Action.

It is therefore respectfully submitted that the amendments to the claims did not necessitate a final rejection. And since the final rejection was not based on information submitted in an IDS under 37 C.F.R. § 1.97(c), it is respectfully submitted that under MPEP § 706.07(a), the finality of the rejections is premature. Withdrawal of the finality of all of the rejections and entry of the amendments above as of right is therefore respectfully requested.

Rejections under 35 U.S.C. § 102

Claims 1-2, 4, and 7-9 were rejected under 35 U.S.C. § 102(b) over Japanese Patent Application No. 08054067A to Kinoshita et al. (hereinafter “Kinoshita”). Kinoshita is in written Japanese, however, a machine translation of the text, made available from the Japanese Patent Office website, is enclosed herewith for the convenience of the Examiner.

Kinoshita describes a full split type mechanical seal. The mechanical seal includes a seat ring (15), which is a static element, and seal ring (17) which is a rotary seal element (see Abstract). A sliding, sealing interface is formed where ring (15) abuts (at S) against ring (17) (paragraph [0013]). A retainer ring (20) is integrally fastened against seal ring holder (18), which in turn braces the outer peripheral surface of the seal ring (17) (Abstract). Drive ring (22) is integrally coupled to retainer ring (20) by drive pins (bolts 24) (see Abstract and paragraph [0014]). Drive ring (22) is fastened to rotatable shaft (11) by set bolts (23) (paragraph [0014] and Fig. 6). In this configuration, seal ring (17) ultimately follows as shaft (11) rotates. Drive ring (22) and retainer ring (20) are each divided into two sections integrally fastened against each other so as to be removable by separating the two sections (see abstract as well as Figs 5 and 6).

In contrast, amended Claim 1 recites a divided driver device for a mechanical face seal. The driver device is axially sub-divided into a radially divided retaining ring for retaining a seal ring and a radially divided mounting ring for mounting to a rotary component. The mounting ring includes at least a pair of sections in the form of segments of a circle. The sections are adapted to be combined into a ring having an inner radial dimension that is smaller than that of the retaining ring and smaller than the nominal outer radial dimension of the rotary component,

for clamping engagement with the rotary component, wherein the retaining ring and the mounting ring are coupled together with play.

Kinoshita does not teach, suggest, or disclose the divided driver device recited in amended Claim 1. In particular, Kinoshita fails to describe the retaining ring and mounting ring coupled together with play, as recited in amended Claim 1. Instead, Kinoshita discloses a purely rigid connection between the retaining and mounting rings as can clearly be seen from Fig. 1. The mounting ring (22) is bolted by means of bolts (24) to the retaining ring (20), which itself holds seal ring (17) in a rigid manner (compare drive pin 22 loosely seated in recess 23, shown in Fig. 2 of the present application). Thus Kinoshita discloses a rigid overall structure and does not teach, suggest, or disclose a loose-fit coupling between the retaining and mounting rings as recited in amended Claim 1.

The structure recited in Claim 1, has advantages over the rigid structure described by Kinoshita. Having play between the mounting ring and the retaining ring means that distortions of the mounting ring that can readily occur when clamping it on the shaft do not affect the orientation of the retaining ring (see Page 6, last paragraph through line 3 on Page 7 of the application). Therefore, no specific care needs to be taken for mounting the mounting ring properly. When both rings are rigidly coupled, a distortion of the mounting ring results in deviation from an ideal orientation of the retaining ring and thereby that of the rotary seal ring in respect to the stationary seal ring.

Amended Claim 8 recites a divided mechanical face seal having, *inter alia*, a retaining ring and a mounting ring including at least a pair of sections in the form of segments of a circle. The sections are adapted to be combined into a ring having an inner radial dimension that is

smaller than the nominal outer radial dimension of the rotary component for clamping engagement with the rotary component. The retaining ring and the mounting ring are coupled together with play, just as recited in amended Claim 1. It has been established above with respect to amended Claim 1 that Kinoshita does not describe such a mounting ring.

Since Kinoshita does not teach, suggest, or disclose each and every element recited in amended Claims 1 and 8, it is respectfully submitted that Kinoshita does not anticipate amended Claims 1 and 8. Claims 2 and 7 depend from amended Claim 1 and thus include all the elements recited in amended Claim 1. Claim 9 depends from amended Claim 8 and thus includes all the elements recited in Claim 8, as presently amended. Therefore, it is respectfully submitted that for at least the foregoing reasons, Kinoshita does not anticipate Claims 1-2 and 7-9. Withdrawal of the rejection under 35 U.S.C. § 102(b) is therefore respectfully requested.

Rejections Under 35 U.S.C. § 103

Claim 3 was rejected under 35 U.S.C. § 103(a) over Kinoshita. Kinoshita has been described above. Claim 3 recites a driver device according to claim 2, wherein the peripherally aligned end faces of the retaining ring have a roughness $\leq 1.0 \mu\text{m}$, preferably $\leq 0.8 \mu\text{m}$, and most preferably $0.5 \mu\text{m}$.

Kinoshita does not disclose the particular roughness of the end faces recited in Claim 3, as per Page 4 of the Office Action. Further, it has been established above that Kinoshita does not teach, suggest, or disclose each and every element recited in Claim 1, as presently amended. Claim 3 depends from amended Claim 1 and thus includes all of the elements recited in Claim 1, as presently amended. Therefore, in addition to failing to disclose the roughness, there are whole

other elements of Claim 3 that Kinoshita fails to teach, suggest, or disclose. Therefore it is respectfully submitted that Kinoshita does not anticipate or render obvious Claim 3, and there is no *prima facie* case of obviousness with respect to Claim 3 based on Kinoshita. Withdrawal of the rejection under 35 U.S.C. § 103 is therefore respectfully requested.

CONCLUSION


It is respectfully submitted that none of the prior art of record, alone or in combination, teaches, discloses or suggests the invention as presently claimed. Based upon the foregoing, favorable consideration of Claims 1-3 and 7-9 is respectfully requested.

If it is believed that an interview would advance prosecution, the Examiner is invited to call Applicant's representative at the number below. Likewise, if the Examiner disputes the validity of any of the pending Claims, Applicants respectfully request an interview with the Examiner to discuss why the Claims are patentable.

It is respectfully submitted that this response is timely filed. The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 04-1105, under Order No. 62909(51994).

Respectfully submitted,

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PATENT ABSTRACTS OF JAPAN

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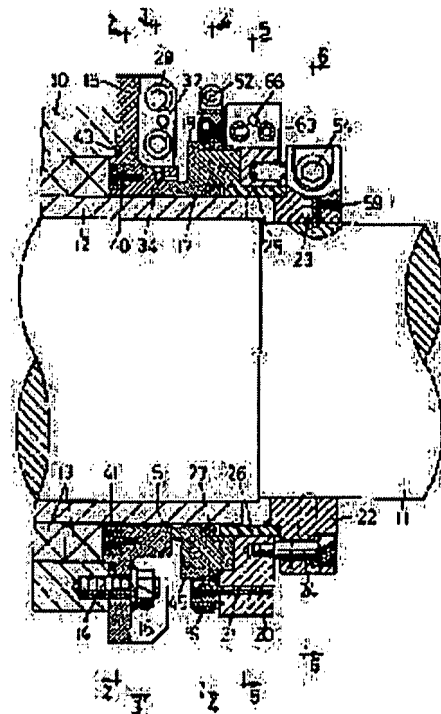
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(54) FULL SPLIT TYPE MECHANICAL SEAL

(57)Abstract:

PURPOSE: To provide a complete division type mechanical seal which is constituted to conveniently assemble and disassemble from the radial direction of a rotary shaft.

CONSTITUTION: A complete division type mechanical seal comprises a seat ring 15 being a static seal element; a seal ring 17 being a rotary seal element; a seal ring holder 18 to brace the outer peripheral surface of the seal ring 17; a holder band 19 to further brace the outer peripheral surface of the holder 18; a retainer ring 20 integrally fastened against the seal ring holder 18; a drive ring 22 integrally coupled to the retainer ring 20; and a compression spring 25 to exert a back pressure on the seal ring 17; and a shaft packing 27. The packing 27 and the holder band 19 are formed in a C-shape in which expansion deformation from a division groove is practicable. Meanwhile, remaining rigid constituting parts are all divided into two sections, and the constituting parts are integrally fastened against each other so as to be removable at a division surface therebetween.



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15.08.2006

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CLAIMS

[Claim(s)]

[Claim 1] The seat ring by which conclusion unification was carried out at the overhang end face of fixed casing (10) (15), The seal ring which fitted loosely into the revolving shaft (11) which penetrates the above-mentioned casing (10) that a sliding sealing surface (S) should be formed between [with the seat ring (15)] contiguity (17), Shaft packing enclosed with the mutual spare time of the inner skin of the seal ring (17), and the peripheral face of a revolving shaft (11) (27), The seal ring electrode holder which supports the peripheral face of the above-mentioned seal ring (17) from under (18), The electrode-holder band which supports the peripheral face of the electrode holder (18) from under further (19), The retainer ring by which conclusion unification was carried out at the seal ring electrode holder (18) that the back end face of the above-mentioned seal ring (17) should be restrained (20), The drive ring by which inserted in the above-mentioned revolving shaft (11), and was united with it, and connection unification was carried out with the above-mentioned retainer ring (20) through the drive pin (24) (22), It has the compression spring (25) inserted between [of the drive ring (22) and retainer ring (20)] contiguity that back pressure should be given to the above-mentioned seal ring (17). the above-mentioned shaft packing (27) and an electrode-holder band (19) -- each -- the extension from a groove (61) and (49), while molding to deformable C character type A drive ring (22) is divided into two at the pair which faces each other entirely at the above-mentioned seat ring (15) of the complementary, a seal ring (17), a seal ring electrode holder (18), and a retainer ring (20) list. Perfect assembled-die mechanical seal characterized by carrying out conclusion unification so that the parting plane (44) and the parting plane of a seal ring electrode holder (18) (48) of a seal ring (17) may carry out the phase change only of the decussation include angle of arbitration that attachment and detachment by the parting plane are free, and at least.

[Claim 2] Perfect assembled-die mechanical seal according to claim 1 characterized by carrying out conclusion unification at an overall perfect circle ring format with the wedge for an alignment (32) and bolt (29) of the taper pin mold which penetrates the seat ring segment (15a) (15b) to which 2 ****s of seat rings (15) were carried out to the parting plane (28).

[Claim 3] Perfect assembled-die mechanical seal according to claim 1 characterized by having put the alignment ring [small diameter / seat ring / (15)] (40) carried out 2 ****s on the basis of the related condition in which the parting plane (42) carries out a phase change to the parting plane (28) of a seat ring (15) to the seat ring (15), and unifying.

[Claim 4] Perfect assembled-die mechanical seal according to claim 1 characterized by carrying out conclusion unification at an overall perfect circle ring format with the wedge for an alignment (66) and bolt (63) of the taper pin mold which penetrates the retainer ring segment (20a) (20b) to which 2 ****s of retainer rings (20) were carried out to the parting plane (62).

[Claim 5] The seat ring by which conclusion unification was carried out at the overhang end face of fixed casing (10) (15), The seal ring which fitted loosely into the revolving shaft (11) which penetrates the above-mentioned casing (10) that a sliding sealing surface (S) should be formed between [with the seat ring (15)] contiguity (17), Shaft packing enclosed with the mutual spare time of the inner skin of

the seal ring (17), and the peripheral face of a revolving shaft (11) (27), The seal ring electrode holder which supports the peripheral face of the above-mentioned seal ring (17) from under (18), The electrode-holder band which supports the peripheral face of the electrode holder (18) from under further (19), The retainer ring by which conclusion unification was carried out at the seal ring electrode holder (18) that the back end face of the above-mentioned seal ring (17) should be restrained (20), The retainer ring holder which supports the peripheral face of the retainer ring (20) from under (78), The drive ring by which inserted in the above-mentioned revolving shaft (11), and was united with it, and connection unification was carried out with the above-mentioned retainer ring (20) through the drive pin (24) (22), The drive ring holder which supports the peripheral face of the drive ring (22) from under (84), It has the compression spring (25) inserted between [of the drive ring (22) and retainer ring (20)] contiguity that back pressure should be given to the above-mentioned seal ring (17). the above-mentioned shaft packing (27) -- the extension from a groove (61), while molding to deformable C character type The above-mentioned seat ring (15) of the complementary, a seal ring (17), a seal ring electrode holder (18), A drive ring holder (84) is divided into two at the pair which faces each other entirely at an electrode-holder band (19), a retainer ring (20), a retainer ring holder (78), and a drive ring (22) list. Perfect assembled-die mechanical seal characterized by carrying out conclusion unification so that the parting plane (44) and the parting plane of a seal ring electrode holder (18) (48) of a seal ring (17) may carry out the phase change only of the decussation include angle of arbitration that attachment and detachment by the parting plane are free, and at least.

[Claim 6] Perfect assembled-die mechanical seal according to claim 5 characterized by carrying out conclusion unification at an overall perfect circle ring format with the bolt (29) which penetrates a parting plane (28) as well as the wedge for an alignment (32) of the cross-joint fitting mold by which the seat ring segment (15a) (15b) to which 2 ****s of seat rings (15) were carried out is placed between the parting planes (28).

[Claim 7] The fitting side of a seal ring electrode holder (18) and the electrode-holder band (19) which supports this from under, A fitting side with the drive ring holder (84) which supports a drive ring (22) and this from under in a fitting side list with the retainer ring holder (78) which supports a retainer ring (20) and this from under Perfect assembled-die mechanical seal according to claim 5 characterized by molding the all mutually as the wedge surface for an alignment of the ***** spline tooth form (77), (83), and (89).

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the mechanical seal of various rotary machine instruments, such as a pump, an agitator, a compressor, and a bulb, and the large-sized or perfect assembled die useful to the rotary machine of a vertical type especially used for the bottom of a high-pressure condition.

[0002]

[Description of the Prior Art] About the assembled-die mechanical seal for easy-izing a maintenance, JP,47-36058,B and JP,47-34450,Y are proposed, for example.

[0003]

[Problem(s) to be Solved by the Invention] However, although a quiescence seal element consists of the division object of an outside element (7) and an inside element (9) and a rotation seal element also consists of the division object of an outside element (13) and an inside element (15) in the former well-known invention Since it is not divided, in case each of support ring (3) which supports these, and (5) performs a maintenance, along the direction of an axis of a revolving shaft (1), it must carry out slide actuation or must extract the support ring (3) and (5) further.

[0004] On the other hand, in the latter well-known design, if a rotation seal element (5) and its support ring (9) consist of the piece of division (C), (D), (10), and (11), since the quiescence seal element (3) is not divided, if ** is also in charge of exchange of the quiescence seal element (3) etc., it needs to extract this too along the direction of an axis of a revolving shaft (1).

[0005] Only in the rotation seal element which forms a sliding sealing surface in the conventional mechanical seal, that is, since [or / which is an assembled die a part so to speak] the rotation seal element and a quiescence seal element are divided, It must make have to slide along the direction of an axis the above-mentioned component part of the complementary or extract. Especially, in the case of the mechanical seal currently used for the agitator and pump of a vertical type, and other established rotary machine instruments, great time amount and a great effort will be required on the maintenance, and there is large-sized or a problem which is obliged also to decline in an operating ratio.

[0006]

[Means for Solving the Problem] This invention has planned [therefore] amelioration of such a technical problem. As mechanical seal of a perfect assembled die The seat ring by which conclusion unification was carried out at the overhang end face of fixed casing the 1st, The seal ring which fitted loosely into the revolving shaft which penetrates the above-mentioned casing that a sliding sealing surface should be formed between [with the seat ring] contiguity, Shaft packing enclosed with the mutual spare time of the inner skin of the seal ring, and the peripheral face of a revolving shaft, The seal ring electrode holder which supports the peripheral face of the above-mentioned seal ring from under, and the electrode-holder band which supports the peripheral face of the electrode holder from under further, The retainer ring by which conclusion unification was carried out at the seal ring electrode holder that the back end face of the above-mentioned seal ring should be restrained, The drive ring by

which inserted in the above-mentioned revolving shaft, and was united with it, and connection unification was carried out with the above-mentioned retainer ring through the drive pin, It has the compression spring inserted between [of the drive ring and retainer ring] contiguity that back pressure should be given to the above-mentioned seal ring, and is [0007]. the above-mentioned shaft packing and an electrode-holder band -- each -- the extension from a groove -- having carried out the conclusion unification of the drive ring at the above-mentioned seat ring of the complementary, the seal ring, the seal ring electrode holder, and the retainer ring list so that it might divide into two and the parting plane and the parting plane of a seal ring electrode holder of a seal ring might carry out the phase change only of the decussation include angle of arbitration to the pair which faces each other entirely that attachment and detachment by the parting plane are free, and at least while molding to deformable C character type -- the description -- carrying out -- [0008] Moreover, the seat ring by which conclusion unification was carried out as well as the 2nd at the overhang end face of fixed casing, The seal ring which fitted loosely into the revolving shaft which penetrates the above-mentioned casing that a sliding sealing surface should be formed between [with the seat ring] contiguity, Shaft packing enclosed with the mutual spare time of the inner skin of the seal ring, and the peripheral face of a revolving shaft, The seal ring electrode holder which supports the peripheral face of the above-mentioned seal ring from under, and the electrode-holder band which supports the peripheral face of the electrode holder from under further, The retainer ring by which conclusion unification was carried out at the seal ring electrode holder that the back end face of the above-mentioned seal ring should be restrained, The retainer ring holder which supports the peripheral face of the retainer ring from under, The drive ring by which inserted in the above-mentioned revolving shaft, and was united with it, and connection unification was carried out with the above-mentioned retainer ring through the drive pin, It has the drive ring holder which supports the peripheral face of the drive ring from under, and the compression spring inserted between [of the drive ring and retainer ring] contiguity that back pressure should be given to the above-mentioned seal ring, and is [0009]. the above-mentioned shaft packing -- the extension from a groove -- while molding to deformable C character type, it is characterized by carrying out the conclusion unification of the drive ring holder so that it may divide into two and the parting plane and the parting plane of a seal ring electrode holder of a seal ring may carry out the phase change only of the decussation include angle of arbitration to the pair which faces each other entirely that attachment and detachment by the parting plane are free, and at least at the above-mentioned seat ring of the complementary, a seal ring, a seal ring electrode holder, an electrode-holder band, a retainer ring, a retainer ring holder, and a drive ring list [0010]

[Function] Since according to the above-mentioned configuration of this invention 2 ****s not only of the seat ring which forms a sliding sealing surface, and a seal ring but all its rigidity component part are carried out even if it is in the any, there is no need of making sliding along the direction of an axis of a revolving shaft these furthermore extracting on the activity of assembly, decomposition, exchange, etc., etc., and assembly, decomposition, etc. can be maintained simple from [the] a path so that it can cling to the halfway section of a revolving shaft.

[0011] consequently, the agitator and pump of especially large-sized or a vertical type, a bulb, and other rotary machine instruments -- the circumference of its start and established machine -- adjustment of the above-mentioned component part and the exchange top need -- a case so that there may be no sufficient tooth space -- remarkable -- being useful -- the operating ratio -- ***** -- things are made.

[0012]

[Example] Hereafter, if the concrete configuration of this invention is explained in full detail based on a drawing, drawing 1 -17 show radical this example of the mechanical seal. Cylindrical fixed casing over which (10) was jugged out of various bodies of a rotary machine instrument (illustration abbreviation), such as an agitator, a pump, a compressor, and a bulb, in one, The revolving shaft which extends in the penetration condition of the casing (10), and (12) (11) The rotation sleeve to the revolving shaft (11) by which covering unification was carried out partially, Gland packing with which (13) was enclosed between the rotation sleeve (12) and above-mentioned casing (10), (14) is two or more stud bolts which stood erect in one in the direction of an axis of a revolving shaft (11) from the overhang end face of the

above-mentioned casing (10). After the seat ring (15) as a quiescence seal element is inserted in this, fixed unification will be carried out with a conclusion nut (16) with the stud bolt (14).

[0013] On the other hand, (17) is a seal ring as a rotation seal element, and has fitted loosely into the above-mentioned rotation sleeve (12) that the sliding sealing surface (S) which intersects perpendicularly with the direction of an axis of a revolving shaft (11) between [with the above-mentioned seat ring (15)] contiguity should be formed. The seal ring electrode holder with which (18) supports the peripheral face of the seal ring (17) from under, the electrode-holder band with which (19) supports further the peripheral face of the seal ring electrode holder (18) from under, and (20) are retainer rings which similarly restrain the back end face of a seal ring (17), and conclusion unification is carried out with the above-mentioned seal ring electrode holder (18) through two or more bolts (21) which meet in the direction of an axis of a revolving shaft (11).

[0014] Moreover, the conclusion unification of (22) is carried out with the above-mentioned retainer ring (20) through two or more drive pins (bolt) (24) which are the drive rings ****(ed) by the set bolt (23) so that it might really rotate, and meet in the direction of an axis of a revolving shaft (11) too to the peripheral face of the above-mentioned revolving shaft (11). (25) is two or more compression springs inserted between [of the retainer ring (20) and drive ring (22)] contiguity, and closes a sliding sealing surface (S) with the seat ring (15) by giving back pressure to the above-mentioned seal ring (17). It is the attached sleeve by which fitting was carried out to the drive ring (22), and the above-mentioned retainer ring (20) is ****(ed) by the peripheral face so that (26) may be jugged out toward the above-mentioned seal ring (17). (27) is shaft packing (O ring) by which it is placed between the mutual spare time of the attached sleeve (26) and above-mentioned seal ring (17), and catches and seals the fluid from the high-tension side.

[0015] Although the mechanical seal of this invention is assembled like drawing 1 -6 from the above-mentioned component part The whole From a path to the assembly, the above-mentioned seat ring which is the rigidity component part so that it can decompose (15) of a revolving shaft (11) A seal ring (17), a seal ring electrode holder (18), and the drive ring (22) with which fitting of the attached sleeve (26) was carried out to the retainer ring (20) list While 2 ****s is carried out as what is joined by perfect circle ring format from the ring segment of the pair which faces each other entirely The ***** above-mentioned electrode-holder band (19) and ***** shaft packing (27) which remain and which are a component part are molded so that the all may be made to extend from the groove as a C character type with a groove.

[0016] Namely, so that austenite stainless steel material may be adopted as a point ** seat ring (15) and this may be extracted to drawing 7 -9 It consists of the seat ring segment (15a) (15b) of the pair which was carried out 2 ****s on the diameter line and which achieves separate independence. Assembly unification is carried out at an overall perfect circle ring format with every two parallel conclusion bolts (29) which are joined in the two parting plane (28), and penetrate the parting plane (28) respectively.

[0017] (30) is the foolish hole for penetration of each of that conclusion bolt (29), and opening distribution is carried out at one seat ring segment (15b). Similarly, (31) is each conclusion bolt (29) and a screw hole to screw, and correspondence formation is carried out at the seat ring segment (15a) of another side.

[0018] Being placed between the pars intermedia where the above-mentioned conclusion bolt (29) adjoins each other, it is the wedge for an alignment of the taper pin mold pressed fit so that the parting plane (28) of both the seat ring segment (15a) (15b) might be respectively penetrated like drawing 3 , and (32) prevents the location gap by the above-mentioned assembly condition. If the wedge (32) is pressed fit, the foolish hole (30) and screw hole (31) of the above-mentioned conclusion bolt (29) will carry out an agreement free passage correctly with self-**. In addition, it cannot be overemphasized that the above-mentioned conclusion bolt (29) is parallel to the wedge (32) along the direction of a path of a seat ring (15).

[0019] In that case, the center section of the either or both sides has caved in as a concave stepped surface (33) like drawing 8 , and the parting plane (28) of both the seat ring segment (15a) (15b) is joined by the related condition which carries out a metal touch only in the periphery which remains so

that a metal touch may not be carried out extensively. therefore, the junction planar pressure and the degree of adhesion of the parting plane (28) -- greatly -- ***** -- things are made.

[0020] (34) being located in the pars intermedia of the relation which intersects perpendicularly with the above-mentioned parting plane (28) in each seat ring segment (15a) (15b), it is the object for cooling or the pure-water feeding hole for lubrication drilled along the direction of a path, and is carrying out opening toward the tooth back of a seat ring (15). With the pure water fed here, the lubrication action was cooled or carried out and the sliding sealing surface (S) of a seat ring (15) and a seal ring (17) is come. In addition, the joining unification of the special alloy (for example, cobalt and the Stellite alloy of tungsten content) (35) is carried out in the sliding sealing surface (S) where the seat ring (15) contacts a seal ring (17).

[0021] Moreover, (36) is two or more cavities which maintained fixed spacing at the tooth back of each seat ring segment (15a) (15b), and were given to it, and scattering opening of the foolish hole for penetration (38) of the stud bolt (14) which stands erect from the overhang end face of the above-mentioned casing (10) in the clamp face (37) partially formed into the light-gage flatbed by this is carried out to the overall radiation symmetrical distribution mold.

[0022] (39) prevents the location gap in the assembly condition of the above-mentioned seat ring (15) with the alignment ring (40) which is the concave circumferential groove for alignment ring acceptance which cut as horseshoe-shaped [mutual / which carries out an agreement free passage], and was lacked, and is put on the transverse plane of each seat ring segment (15a) (15b) here.

[0023] That is, so that clearly [the alignment ring (40) may be an austenitic-stainless-steel product and] from drawing 1 and 2 Although it consists of the alignment ring segment (40a) (40b) of the pair to which the dimension is carried out to small diameter from the seat ring (15), and 2 ***** also of this were carried out on the diameter line and which achieves separate independence Without carrying out the conclusion unification of the pair, fitting is carried out to each into the concave circumferential groove (39) of the above-mentioned seat ring segment (15a) (15b), and this is being fixed with two or more bolts (41). And in that case, the phase change only of the decussation include angle of arbitration is carried out so that mutual may not agree [the parting plane (42) of an alignment ring (40), and the parting plane (28) of the above-mentioned seat ring (15)].

[0024] However, since both the seat ring segment (15a) (15b) is concluded by the alignment condition through a wedge (32) as above-mentioned, even if installation of the alignment ring (40) aligned further omits this, it does not interfere. In addition, (43) is the gasket (O ring) inserted in the clamp face (37) of the above-mentioned seat ring (15), and seals the contact surface of the clamp face (37) and overhang end face of the above-mentioned casing (10).

[0025] Next, it is maintained at the assembly condition of a perfect circle ring by adopting wear material, such as carbon, as a seal ring (17), consisting of the seal ring segment (17a) (17b) of the pair which was carried out 2 ***** and which achieves separate independence, and being joined in the two parting plane (44) on a diameter line [like drawing 4] this [whose] is also. (45) is a taper-like corner side and is cut by the square corner section of the transverse plane and peripheral face in each seal ring segment (17a) (17b).

[0026] It is an austenitic-stainless-steel product too, and the seal ring electrode holder (18) which supports the peripheral face of the above-mentioned seal ring (17) from under consists of the seal ring electrode-holder segment (18a) (18b) of the separate pair to which 2 ***** also of this were carried out on the diameter line, and the corner side (45) of the above-mentioned seal ring (17) and the inhibition side (46) of the shape of a corresponding taper jut it out over the inner skin, and it is formed so that clearly from drawing 10 and 11. (47) is two or more foolish holes for bolt penetration which meet in the direction of an axis of the above-mentioned revolving shaft (11) and by which opening distribution was carried out as an parallel condition at each of that seal ring electrode-holder segment (18a) (18b), and the above-mentioned conclusion bolt (21) with a retainer ring (20) will penetrate it here.

[0027] And the above-mentioned seal ring electrode holder (18) has prevented a possibility that the peripheral face of the seal ring (17) may be supported from under from drawing 4 as a related condition which carried out the phase change only of the decussation include angle of arbitration so that mutual

might not agree [the parting plane (48) and parting plane (44) of a seal ring (17)] a clear passage, and a sealing fluid may be revealed.

[0028] The electrode-holder band (19) which supports further the peripheral face of the above-mentioned seal ring electrode holder (18) from under can be wound around C character type equipped with one groove (49), can be bent, and can carry out extension deformation now compulsorily from the groove (49) so that it may be suggested from drawing 4 . (50) and (51) are the washers and nuts which were welded to the backing strip attached condition, and to the piece of a junction lug (19a) (19b) which the electrode-holder band (19) faces, the conclusion bolt (52) penetrated to this screws them up, and they change the support-from-under immobilization of the seal ring (17) to it into the assembly condition of a perfect circle ring by actuation in the above-mentioned seal ring electrode-holder (18) list.

[0029] Moreover, the above-mentioned revolving shaft (11) and the drive ring (22) which rotates to one So that it may be an austenitic-stainless-steel product too and may extract to drawing 12 -14 With the bolt (54) which penetrates the parting plane (53) after this also consisted of the drive ring segment (22a) (22b) of the separate pair carried out 2 ****s and is joined in the two parting plane (53) on a diameter line Conclusion unification is carried out at an overall perfect circle ring format.

[0030] (55) is the foolish hole for penetration of the conclusion bolt (54), and opening is carried out to one drive ring segment (22a). Similarly, (56) is a conclusion bolt (54) and a screw hole to screw, and correspondence formation is carried out at the drive ring segment (22b) of another side. (57) is two or more screw holes drilled along the direction of centripetism of each drive ring segment (22a) (22b), with the above-mentioned set bolt (23) screwed in here, will be suppressed to the peripheral face of a revolving shaft (11) like drawing 6 , and will be fixed to it. (58) is the screw hole (57) of the set bolt (23), and a small diameter screw hole which intersects perpendicularly, and prevents the slack of the above-mentioned set bolt (23) with the stop screw (59) thrust into this.

[0031] (60) being located in the pars intermedia of each drive ring segment (22a) (22b) similarly, it is two or more foolish holes for bolt penetration by which opening distribution was carried out in parallel along the direction of an axis of a revolving shaft (11), and when the above-mentioned drive pin (24) penetrates here, conclusion unification is carried out with a retainer ring (20).

[0032] Two ****s (26) of the attached sleeves jutted out of the above-mentioned drive ring (22) toward a seal ring (17) are carried out, this is synthetic-resin products, such as Teflon, and fitting is carried out in since then in the drive ring (22). And the above-mentioned shaft packing (27) molded by C character type by grant of a groove (61) is enclosed with the seal interior of a room ****(ed) between the attached sleeve (26) and seal ring (17) by the compulsory extension deformation from the groove (61) as a **** condition to drawing 1 and a rotation sleeve (12) like 4.

[0033] Furthermore, so that clearly [the retainer ring / the above-mentioned retainer ring (20) may be an austenite stainless steel product and] from drawing 15 -17 It consists of the retainer ring segment (20a) (20b) of the pair which was carried out 2 ****s on the diameter line and which achieves separate independence. Conclusion unification is carried out at perfect circle ring format like drawing 5 with every two parallel bolts (63) which are joined in the two parting plane (62), and penetrate the parting plane (62).

[0034] (64) is the foolish hole for penetration of the conclusion bolt (63), and opening distribution is carried out at one retainer ring segment (20a). Similarly, (65) is a conclusion bolt (63) and a screw hole to screw, and correspondence formation is carried out at the retainer ring segment (20b) of another side.

[0035] Being located in the pars intermedia where the above-mentioned conclusion bolt (63) adjoins each other, (66) is the wedge for an alignment pressed fit so that the parting plane (62) of both the retainer ring segment (20a) (20b) might be penetrated, consists of a taper pin too and prevents the location gap by the above-mentioned assembly condition. If the wedge (66) is pressed fit, the foolish hole (64) and screw hole (65) of the above-mentioned conclusion bolt (63) will carry out an agreement free passage with self-**.

[0036] In the pars intermedia of each retainer ring segment (20a) (20b), the conclusion unification of (67) will be carried out with a seal ring electrode holder (18) through the above-mentioned bolt (21) which are two or more screw holes by which penetration formation was carried out, and is thrust into the

parallel condition of meeting in the direction of an axis of a revolving shaft (11) here.

[0037] (68) is the restricted side of the L character mold similarly turned off and lacked in the square corner section of the transverse plane and inner skin in a retainer ring segment (20a) (20b), and stops on both sides of a seal ring (17) conjointly with the taper-like inhibition side (48) of the above-mentioned seal ring electrode holder (18).

[0038] In the location deflected inside the screw hole (67) which receives a conclusion bolt (21) with the above-mentioned seal ring electrode holder (18), (69) is two or more spring receptacle concaves similarly cut and lacked in the retainer ring segment (20a) (20b), and each of that tooth back is carrying out opening. And the insertion set of the above-mentioned compression spring (25) is carried out like drawing 1 the spring acceptance concave (69) of the retainer ring (20), and between [which face each other] the above-mentioned drive rings (22).

[0039] (70) is two or more screw holes too drilled in the pars intermedia of each retainer ring segment (20a) (20b) along the direction of an axis of a revolving shaft (11) as a condition of not penetrating, and screwing conclusion of the point of the drive pin (24) which penetrates the above-mentioned drive ring (22) is carried out here.

[0040] Therefore, while the turning effort of a revolving shaft (11) is transmitted to the above-mentioned seal ring (17) through a seal ring electrode holder (18) at a retainer ring (20) list from a drive ring (22), a normal sliding sealing surface (S) with a seat ring (15) will be maintained according to the energization force of ** and the above-mentioned compression spring (25) of wearing the seal ring (17) out.

[0041] That is, about 1 constant value is maintained comparatively (balance ratio) with the seal fluid pressure which acts on the seal ring (17) as a rotation seal element from behind, and the planar pressure force of a sliding sealing surface (S).

[0042] According to the configuration of above-mentioned radical this example, rigidity seat ring (15) and seal ring (17), In a seal ring electrode holder (18) and a retainer ring (20) list, a drive ring (22) The seat ring segment (15a) (15b) and seal ring segment (17a) of a pair which face each other respectively (17b), It changes from a drive ring segment (22a) (22b) to an electrode-holder segment (18a) (18b) and a retainer ring segment (20a) (20b) list. Since [the] the conclusion unification of the attachment and detachment by the parting plane is enabled entirely, it can cling to the halfway section of the longitudinal direction in a revolving shaft (11) easily from [the] a path -- as -- assembly -- or it can decompose, and it is not necessary to carry out slide actuation, furthermore to extract in accordance with the revolving shaft (11) Consequently, it is remarkably useful on the maintenance of an existing plant without tooth space sufficient [for adjusting or exchanging on the various rotary machine instruments of a vertical type, and the outskirts of it] on a large scale etc.

[0043] From drawing 1 -6 so that clearly [in the assembly busy condition] And the parting plane of a seal ring (17) (44), The parting plane (48) of the seal ring electrode holder (18) does not agree mutually, but is carrying out the phase change only of the arbitrary decussation include angle. Moreover, the parting plane of a seat ring (15) (28), The parting plane (42) of the alignment ring (40) does not agree mutually, but since it is maintained at the related condition of too arbitrary decussation include angles which carries out a phase change, there is no possibility that a sealing fluid may be revealed and a reliable stable shaft-seal condition can be attained.

[0044] Furthermore, the seat ring segment (15a) (15b) of the pair which forms the above-mentioned seat ring (15) By carrying out conclusion unification with the seal ring electrode holder (18) which supports the peripheral face of a seal ring (17) from under, while changing assembly unification into the superposition alignment condition of the wedge for an alignment (32), and an alignment ring (40) Since the conclusion unification also of the retainer ring segment (20a) (20b) which the retainer ring (20) which restrains the back end face of the seal ring (17) faces is carried out through the wedge for an alignment (66), Even if it carries out application implementation at the rotary machine instrument used for the bottom of a severe high-pressure condition, stability and the positive shaft-seal engine performance can be demonstrated extremely, and it excels also in the endurance.

[0045] Next, drawing 18 -22 show the deformation example of this invention, and a different point from above-mentioned radical this example of the configuration above figures 1 -17 is as follows.

[0046] Namely, while an alignment operation is carried out through the wedge (32) of a cross-joint fitting mold at the parting plane (28), the seat ring segment (15a) (15b) of the pair which forms [1st] a seat ring (15) The bolt (29) for concluding both the seat ring segment (15a) (15b) is fixed with a nut (72), after penetrating as every one to the piece (71) comrade of a junction lug who juts out of each seat ring segment (15a) (15b).

[0047] The electrode-holder band (19) which supports the peripheral face of a seal ring electrode holder (18) from under to the 2nd as an austenite stainless steel product It consists of the electrode-holder band segment (19a) (19b) of the pair which was carried out 2 ****s on the diameter line and which achieves separate independence. With the bolt (75) and nut (76) per which are joined in the two parting plane (73), and penetrate the piece (74) comrade of a junction lug Conclusion unification is carried out at an overall perfect circle ring format, and also the inner skin of the electrode-holder band (19) and the peripheral face of the above-mentioned seal ring electrode holder (18) mutually as a wedge surface for an alignment of the ***** spline tooth form (77) It changes fitting into the highly precise alignment condition.

[0048] In that case, it is desirable to carry out the phase change only of the arbitrary decussation include angle so that the parting plane (48) and the parting plane of an electrode-holder band (19) (73) of a seal ring electrode holder (18) may not agree.

[0049] The separate retainer ring holder made from austenitic stainless steel (78) which supports [3rd] the peripheral face of a retainer ring (20) from under is prepared. It consists of the retainer ring holder segment (78a) (78b) of the pair to which 2 ****s also of this were carried out on the diameter line and which faces each other. With the bolt (81) and nut (82) per which penetrate the piece (80) comrade of a junction lug after being joined in the two parting plane (79), while conclusion unification is carried out at an overall perfect circle ring format Fitting of the inner skin of the retainer ring holder (78) and the peripheral face of the above-mentioned retainer ring (20) is too carried out to the location gap impossible as a wedge surface for an alignment of the ***** spline tooth form (83) mutually.

[0050] Also in such a case, as for the parting plane (62) and the parting plane of a retainer ring holder (78) (79) of a retainer ring (20), it is desirable to carry out the phase change only of the arbitrary decussation.

[0051] The separate drive ring holder made from austenitic stainless steel (84) which supports the peripheral face of a drive ring (22) from under is prepared for the 4th. It consists of the drive ring holder segment (84a) (84b) of the pair to which 2 ****s also of this were carried out on the diameter line and which faces each other. With the bolt (87) and nut (88) per which are joined in the two parting plane (85), and penetrate the piece (86) comrade of a junction lug Conclusion unification is carried out and also fitting of the inner skin of a drive ring holder (84) and the peripheral face of a drive ring (22) is mutually carried out to location gap impossible too as a wedge surface for an alignment of the ***** spline tooth form (89).

[0052] Also in such a case, it is suitable for the parting plane (53) and the parting plane of a drive ring holder (84) (85) of a drive ring (22) not to make it agree mutually.

[0053] The rotation sleeve (12) of above-mentioned radical this example is omitted by the 5th, and direct **** of the attached sleeve (26) juttet over a seat ring (15) and a seal ring (17) list out of a drive ring (22) at continuation one is carried out at the peripheral face of a revolving shaft (11).

[0054] Screwing conclusion of the bolt (21) which concludes a seal ring electrode holder (18) and a retainer ring (20) to the 6th is carried out as it of above-mentioned radical this example, and reverse sense to the screw hole (67) by which correspondence formation was carried out at the seal ring electrode holder (18) from the foolish hole (47) by which opening distribution was carried out at the retainer ring (20).

[0055] the drive pin (24) of above-mentioned radical this example is materialized from a bolt by the 7th -- **** -- it is contrary, and this is inserted [it continues it and] and connected between [of a drive ring (22) and a retainer ring (20)] contiguity as a literal pin, and also even if the acceptance concave (69) of the above-mentioned compression spring (25) cuts and lacks in a drive ring (22) side, it is. . . .

[0056] Although it limits for entering the correspondence sign of drawing 1 -17 in the drawing 18 -22

and the detailed explanation is omitted since the configuration of others in the above-mentioned deformation example is substantially the same as that of radical this example of drawing 1 -17 The seat ring entirely performed above 2 ****s if especially the configuration of a deformation example was adopted (15), An electrode-holder band (19), a retainer ring (20), a retainer ring holder (78), Even if the conclusion bolt (29) of a drive ring holder (84), (52), (75), (63), (81), (54), and (87) loosen in a drive ring (22) list By the wedge for the alignment (32), the wedge surface (77), (83), and (89), there is no possibility of a highly precise assembly condition that it may be out of order, and the above-mentioned shaft-seal engine performance and endurance can be raised increasingly.

[0057] In addition, as the above-mentioned wedge (32), it does not restrict to the above-mentioned spline tooth form as a wedge surface (77), (83), and (89) not only in the taper pin mold of radical this example, and the cross-joint fitting mold of a deformation example. The wedge operation or key operation on an alignment of the all can be freely selected, if it is a ***** configuration.

[0058] Although the illustration abbreviation has been carried out if it says from the semantics, the separate seat ring electrode holder which supports the peripheral face of a seat ring (15) from under is also prepared as the pair by which division formation was carried out and which faces each other, and **** doubling ***** is also considered considering the fitting side of this and a seat ring (15) as wedge surfaces for an alignment, such as the above-mentioned spline tooth form.

[0059]

[Effect of the Invention] As mentioned above, the seat ring by which conclusion unification was carried out on the configuration in the mechanical seal of this invention at the overhang end face of fixed casing (10) (15), The seal ring which fitted loosely into the revolving shaft (11) which penetrates the above-mentioned casing (10) that a sliding sealing surface (S) should be formed between [with the seat ring (15)] contiguity (17), Shaft packing enclosed with the mutual spare time of the inner skin of the seal ring (17), and the peripheral face of a revolving shaft (11) (27), The seal ring electrode holder which supports the peripheral face of the above-mentioned seal ring (17) from under (18), The electrode-holder band which supports the peripheral face of the electrode holder (18) from under further (19), The retainer ring by which conclusion unification was carried out at the seal ring electrode holder (18) that the back end face of the above-mentioned seal ring (17) should be restrained (20), The drive ring by which inserted in the above-mentioned revolving shaft (11), and was united with it, and connection unification was carried out with the above-mentioned retainer ring (20) through the drive pin (24) (22), It has the compression spring (25) inserted between [of the drive ring (22) and retainer ring (20)] contiguity that back pressure should be given to the above-mentioned seal ring (17), and is [0060]. the above-mentioned shaft packing (27) and an electrode-holder band (19) -- each -- the extension from a groove (61) and (49), while molding to deformable C character type A drive ring (22) is divided into two at the pair which faces each other entirely at the above-mentioned seat ring (15) of the complementary, a seal ring (17), a seal ring electrode holder (18), and a retainer ring (20) list. Since conclusion unification has been carried out so that the parting plane (44) and the parting plane of a seal ring electrode holder (18) (48) of a seal ring (17) may carry out the phase change only of the decussation include angle of arbitration that attachment and detachment by the parting plane are free, and at least, The trouble of the conventional technique expressed to the beginning is certainly improvable, and while being able to do [the] many activities of assembly, decomposition, exchange, etc., etc. with sufficient convenience from a path so that it can cling to a revolving shaft (11) in all the component parts, it is effective in the ability to obtain the outstanding shaft-seal engine performance.

[0061] And although completely similarly attained from the configuration of claim 5, if such effectiveness adopts the configuration of the claim 5, it can raise increasingly the shaft-seal engine performance and endurance of a rotary machine instrument which are especially used for the bottom of a high-pressure condition.

[0062] Especially, if claims 2 and 3 or the configuration of 6 is adopted, the seat ring segment (15a) (15b) to which 2 ****s of seat rings (15) were carried out With the wedge (32) and the alignment ring (40) put separately for the alignment by which it is placed between the parting planes (28), it is not afraid and the effectiveness to the direction of a path which carries out location gap and which can be

assembled in the very highly precise stable conclusion condition is in the direction list of an axis of the revolving shaft (11).

[0063] Moreover, if the configuration of claim 4 is adopted, the retainer ring segment (20a) (20b) to which 2 ****s of retainer rings (20) were carried out also has the effectiveness which can carry out conclusion unification firmly as a too highly precise alignment condition with the wedge for an alignment (66) by which it is placed between the parting planes (62).

[0064] If the configuration of claim 7 is adopted, furthermore, between a seal ring electrode holder (18) and its electrode-holder band (19), In the mutual list of a retainer ring (20) and its retainer ring holder (78), between a drive ring (22) and its drive ring holder (84) It is not afraid, and all have the effectiveness which carries out location gap too by the wedge surface for an alignment (77), (83), and (89) and which can be maintained at a highly precise ***** condition, and do not have a possibility of reducing the assembly reinforcement as perfect assembled-die mechanical seal, either.

[Translation done.]

* NOTICES *

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- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the sectional side elevation showing the overall assembly condition of the mechanical seal concerning this invention.

[Drawing 2] It is the 2-2 line sectional view of drawing 1 .

[Drawing 3] It is the 3-3 line sectional view of drawing 1 .

[Drawing 4] It is the 4-4 line sectional view of drawing 1 .

[Drawing 5] It is the 5-5 line sectional view of drawing 1 .

[Drawing 6] It is the 6-6 line sectional view of drawing 1 .

[Drawing 7] It is the front view extracting and showing a seat ring.

[Drawing 8] It is the 8 - 8 line sectional view of drawing 7 .

[Drawing 9] It is the 9 - 9 line sectional view of drawing 7 .

[Drawing 10] It is the front view extracting and showing a seal ring electrode holder.

[Drawing 11] It is the 11-11 line sectional view of drawing 10 .

[Drawing 12] It is the front view extracting and showing a drive ring.

[Drawing 13] It is the 13-13 line sectional view of drawing 12 .

[Drawing 14] It is the 14-14 line sectional view of drawing 12 .

[Drawing 15] It is the front view extracting and showing a retainer ring.

[Drawing 16] It is the 16-16 line sectional view of drawing 15 .

[Drawing 17] It is the 17-17 line sectional view of drawing 15 .

[Drawing 18] It is the sectional side elevation showing the deformation example of this invention corresponding to drawing 1 .

[Drawing 19] It is the 19-19 line sectional view of drawing 18 .

[Drawing 20] It is the 20-20 line sectional view of drawing 18 .

[Drawing 21] It is the 21-21 line sectional view of drawing 18 .

[Drawing 22] It is the 22-22 line sectional view of drawing 18 .

[Description of Notations]

(10) - casing

(11) - revolving shaft

(15) - seat ring

(15a) - seat ring segment

(15b) - seat ring segment

(17) - seal ring

(18) - seal ring electrode holder

(19) - electrode-holder band

(20) - retainer ring

(20a) - retainer ring segment

(20b) - retainer ring segment

(22) - drive ring

- (24) - drive pin
- (25) - compression spring
- (27) - shaft packing
- (28) - parting plane
- (29) - bolt
- (32) Wedge for - alignment
- (40) - alignment ring
- (42) - parting plane
- (44) - parting plane
- (48) - parting plane
- (49) - groove
- (61) - groove
- (63) - bolt
- (66) Wedge for - alignment
- (77) Wedge surface for - alignment
- (78) - retainer ring holder
- (83) Wedge surface for - alignment
- (84) - drive ring holder
- (88) Wedge surface for - alignment
- (S) - sliding sealing surface

[Translation done.]